ORA

OFFICE OF RATEPAYER ADVOCATES

Procurement Briefing:
Long-term Procurement Planning, Resource Adequacy, and Joint Reliability Plan

April 28, 2015

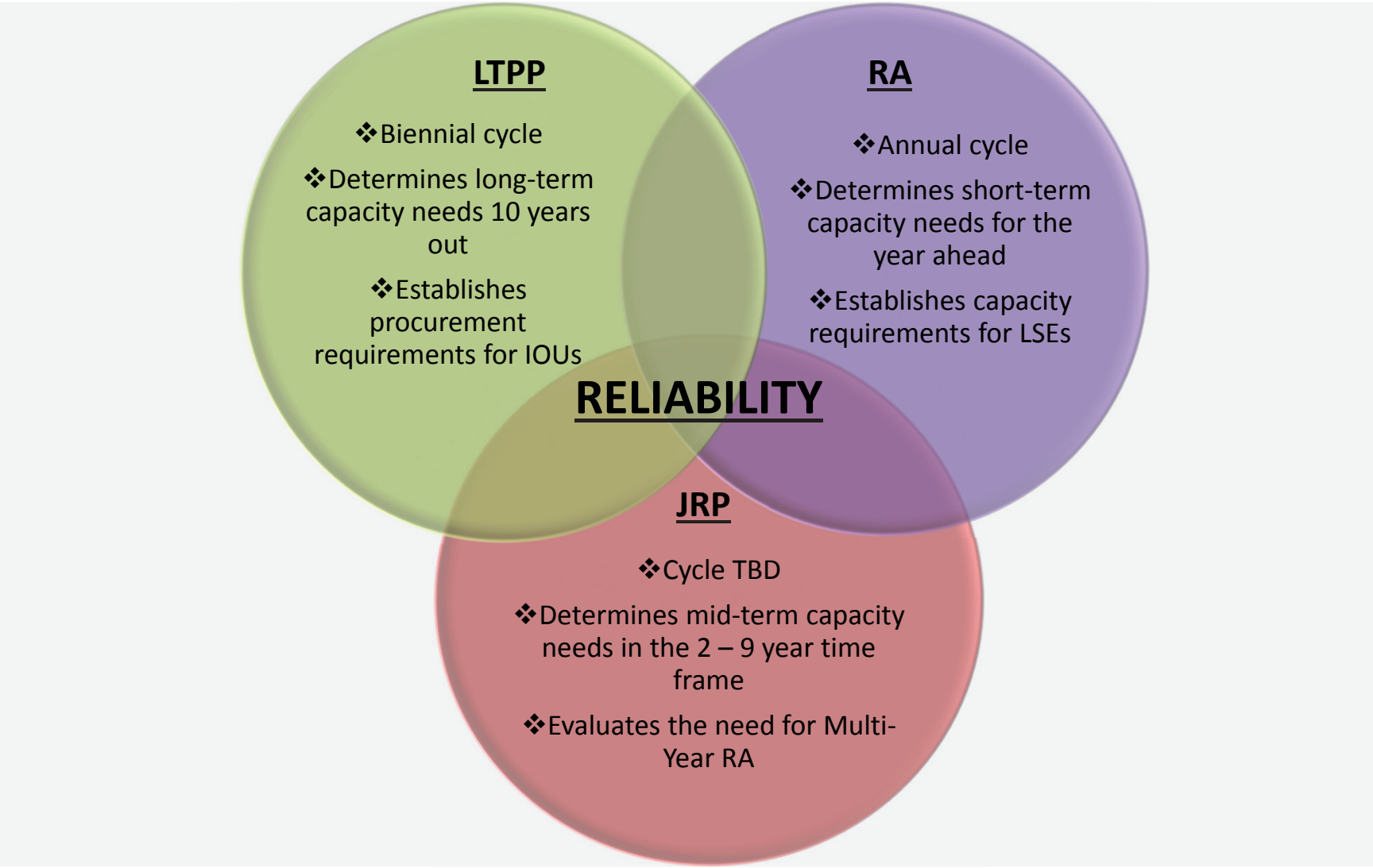
Presentation Overview

Purpose of Presentation

- Provide an overview of CPUC procurement proceedings and how each contributes to electric reliability
  - Resource Adequacy (RA)
  - Joint Reliability Plan (JRP)
  - Long-term Procurement Planning (LTPP)

- Distinguish between types of procurement needed for reliability
  - System Capacity
  - Local Capacity
  - Flexible Capacity

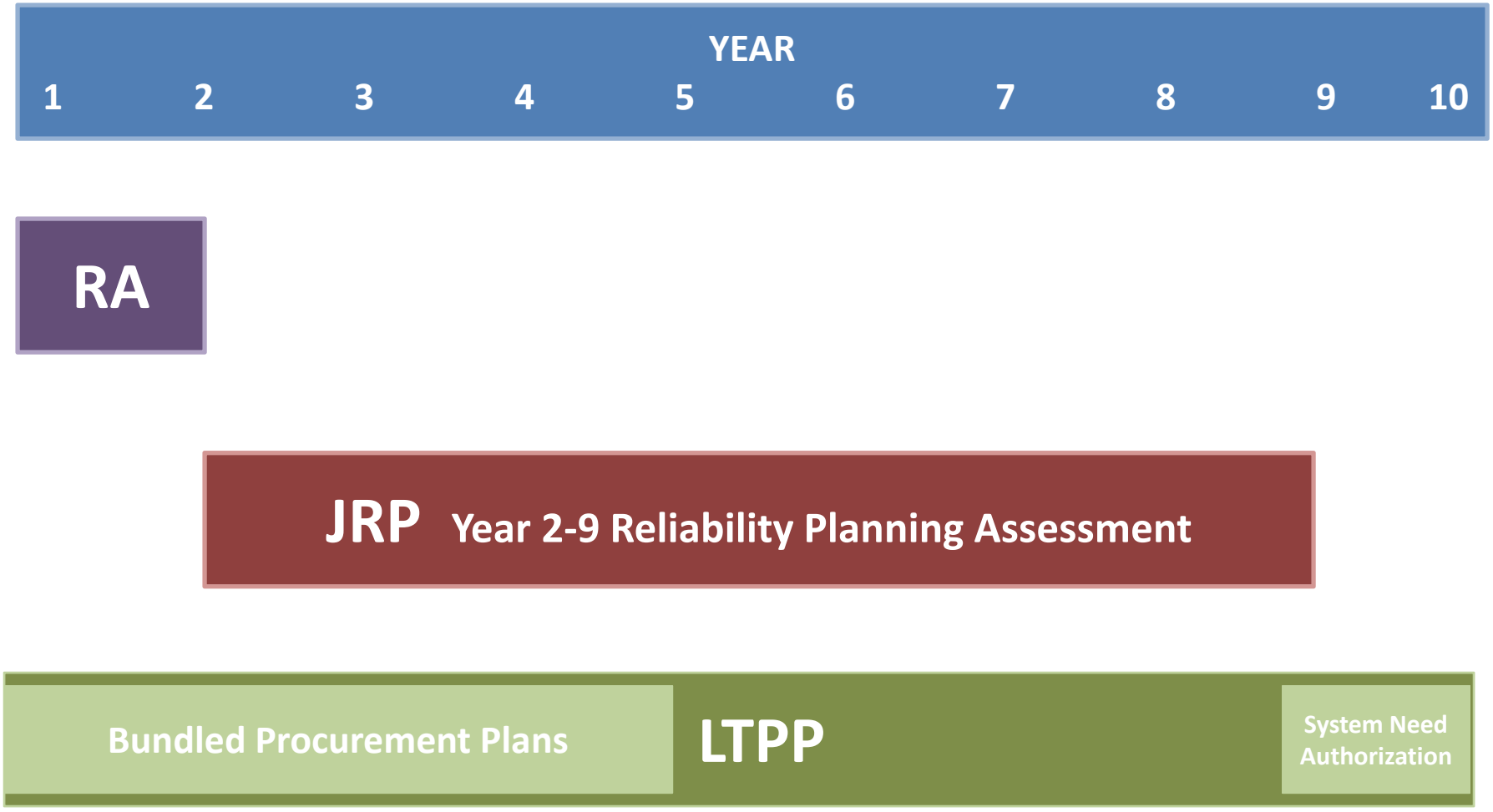
Relationship between RA, JRP, & LTPP



Reliability Outcomes & Resource Authorization

RA	JRP	LTPP
❖ Provides the CAISO with available resources for dispatch in the short-term ❖ Mandates LSEs to contract with existing resources for capacity	❖ Considers preserving resources necessary for reliability in the mid-term ❖ Evaluates resources at risk of retirement and may develop solutions if necessary.	❖ Ensures long-term system reliability and resource sufficiency by identifying local, system, and flexible need through targeted studies that focus on a 10-year planning horizon ❖ Authorizes the IOUs to procure and build out new resources such as gas-fired generation, renewables, EE, DR, and ES to meet any identified need

Reliability Timeline



Resource Adequacy

Established following the 2001 – 2002 Energy Crisis in PU Code §380 to provide sufficient resources for the CAISO to ensure the safe and reliable operation of the grid in a year ahead time frame

- The RA proceeding (D.05-10-042) created a bilateral capacity market and mandated procurement of capacity contracts by Load Serving Entities (LSEs).
- RA applies to all LSEs under CPUC jurisdiction which includes Investor Owned Utilities (IOUs), Electric Service Providers (ESPs), and Community Choice Aggregators (CCAs).
- Three types of RA requirements: System, Local, and Flexible
  - **System RA Capacity**: D.05-10-042 established LSE year-ahead system capacity obligations to meet peak load
  - **Local RA Capacity**: D.06-06-064 mandated LSE procurement of capacity within local transmission constrained areas
  - **Flexible Capacity**: D.14-06-050 established flexible capacity requirements for LSEs

System RA Capacity

Encompasses the entire CAISO grid and is referred to as "generic" capacity procured to meet peak load

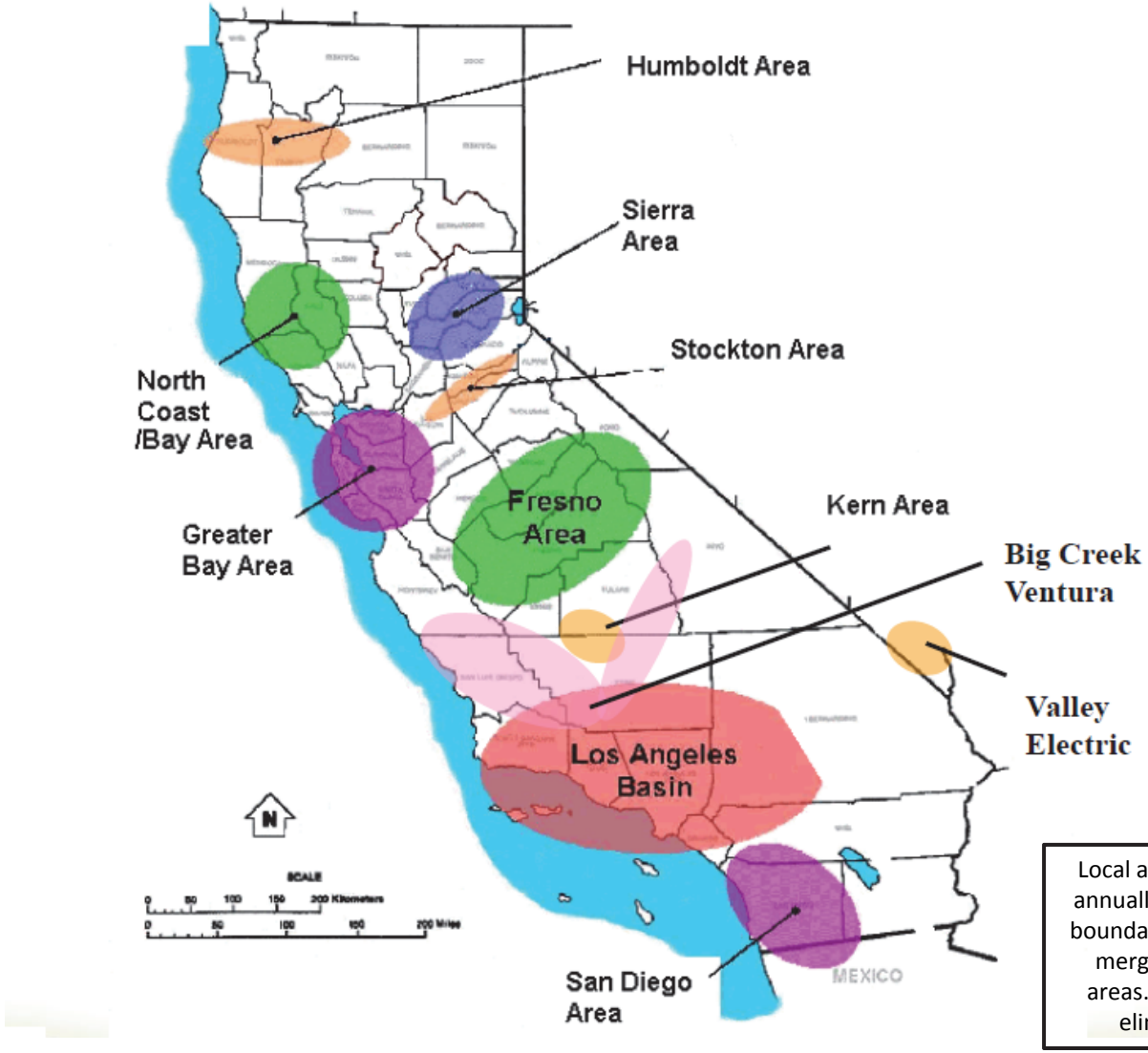
- Need is calculated using forecasted load plus a Planning Reserve Margin (PRM) of 15%.
- Forecasted load is based on a 1-in-2 year California Energy Commission (CEC) forecast.
- An LSE must procure at least 90% of its CPUC assigned load obligation one year ahead and the remaining amount one month ahead.
- Local and Flexible Capacity are subsets of System Capacity.

Local RA Capacity

Local capacity is necessary in geographically-limited areas where transmission lines cannot import adequate energy to meet peak load demands requiring local generation or demand reduction

- There are currently 9 local areas in California.
- Local capacity requirements (LCR) are determined in an annual study by the CAISO and adopted by the CPUC each June.
  - CAISO conducts Power Flow modeling to determine the minimum generation capacity (MW) necessary to mitigate the local reliability problems in those areas.
- The LCR is based on a 1-in-10 year CEC forecast of peak summer load.
- LSEs must procure 100% of local RA capacity obligations one-year ahead.

CAISO LCR Areas



Local areas are reevaluated annually and may have their boundaries redefined and/or merged with other local areas. (Valley Electric was eliminated in 2015)

Flexible RA Capacity

Resources that can be dispatched by the CAISO to ramp their power production up or down to maintain grid reliability

- Flexible resources are needed to operate the grid due to the increasing amount of intermittent solar and wind resources.
  - Intermittent generators, such as wind and solar may create rapid changes in available capacity based on weather and time of day.
- CAISO calculates the flexible capacity need of its system in an annual flexible capacity study.
  - It also calculates individual resource flexible capacity, assigning an Effective Flexible Capacity (EFC) based on the amount of increased or decreased capacity (ramping up or down) the resource can provide in a 3-hour period.
- The CPUC adopts the CAISO's annual flexible capacity study and assigns flexible capacity requirements to its jurisdictional LSEs.
- Flexible capacity requirements compel LSEs to procure at least 90% of their flexible capacity obligation one year ahead and the remaining amount one month ahead.
- The current RA flexible capacity framework is an interim process with a permanent process to be put in place by 2017.

Recent Developments in RA

- The January 6, 2015 RA Scoping Memo (R.14-10-010) created three phases:
  - **Phase 1:** Adopt capacity requirements, review Effective Load Carrying Capacity (ELCC) methodology, and add refinements to various aspects of the RA program in the annual June Decision
  - **Phase 2:** Examine new counting rules for Demand Response (DR) considering an expected May 2015 DR proceeding Ruling
  - **Phase 3:** Consider new CAISO studies on flexible capacity expected in October 2015 and work toward a permanent flexible capacity framework
- Future rulings in the JRP proceeding may establish multi-year RA requirements which could be carried out through the RA proceeding

Effective Load Carrying Capacity (ELCC)

ELCC refers to the ability of a MW of generation from a particular facility to contribute toward preventing loss of load due to insufficient capacity

- Senate Bill (SB) 2 (1X) mandates use of stochastic modeling to determine wind and solar capacity contributions to reliability
- ELCC is being developed by the Energy Division
  - Stochastic Modeling: Estimates probability distributions by allowing for random variation in multiple inputs, such as weather and load, over time
- ELCC values are predicted to reduce capacity values for solar resources and may increase capacity values for wind resources

The Joint Reliability Plan

- Initiated to resolve reliability concerns in the mid-term years
  - Mid-term years are considered to be those years between the RA one year-ahead requirement and LTPP's 10-year forward procurement
- Initiated in December 2013 as a collaborative effort between the CPUC and the CAISO to examine mid-term reliability issues
- Considered implementing multi-year RA requirements, conducting studies of mid-term need, and replacing the backstop procurement mechanism

JRP Tracks

- **Track 1: Multi-year RA (Suspended)**
  - ED Staff Report (issued on October 2, 2014) questioned current need for and benefits of multi-year RA

- **Track 2: Mid-term Reliability Planning Assessment**
  - Mid-term reliability planning assessment will be a cooperative effort between the CAISO, CPUC, and CEC

- **Track 3: Market-based backstop procurement mechanism**
  - Currently under development at the CAISO with participation of the CPUC

Recent Developments in JRP

- **ED Track 1 Report:** Presented many options for stakeholder comments on multi-year RA, including the possibility that there is no current need (October 2, 2014)
  - The report concluded that ORA's risk of unplanned retirement research presents a first step towards assessing the potential magnitude of the risk posed to the system from unplanned retirements.

- A majority of stakeholders, including the CAISO, dismissed a need for current adoption of multi-year RA requirements.
  - CAISO concluded that an appropriate long-term RA framework cannot be established without first developing a more precise, durable, and comprehensive flexible capacity solution.
  - A CPUC ruling issued on January 16, 2015 suspended Track 1.

- Capacity Procurement Mechanism (CPM) replacement settlement discussions are being conducted by the CAISO involving stakeholders, including ED and ORA. CAISO is drafting CPM tariff language for FERC adoption in 2015.

ORA's JRP Analysis:
Risk of Unplanned Retirement & Modeling

- **Track 1:** ORA performed a Risk of Unplanned Retirement analysis to quantify the magnitude of potential unplanned retirements of existing resources that may be needed to meet future flexibility requirements.
  - **Findings:** Nine units potentially at risk of unplanned retirement, comprising approximately 2,412 MW of which 1,389 MW are flexible

- **Production Cost Simulation study for the year 2021:**
  - Sought to identify whether the unplanned retirement of up to 2,412 MW of generation resources would jeopardize system reliability in 2021
  - **Findings:** While there are nine units potentially at risk of unplanned retirement, ORA's modeling results do not indicate that these resources will be needed for reliability in 2021, which is due, in part, to the significant quantity of forward contracting by CPUC LSEs and the current oversupply of available capacity.

- ORA was the only party in the proceeding to estimate the magnitude of the risk of unplanned retirement or perform any resource modeling.

JRP Track 2

- Energy Division conducted a workshop on April 9, 2015, to discuss a Staff proposal for a reliability planning framework for the next ten years.
- The framework proposes to release an annual database update of the forward needs and available / contracted supply.
- A stochastic production simulation model has been proposed to estimate the risk of inefficient resource retirement.

Long-Term Procurement Planning

The "Umbrella" proceeding where the state's electric resource procurement policies and programs are considered in an integrated manner

- Biennial procurement process
  - Every two years the CPUC assesses system, local, and flexible resource needs over a ten-year horizon through a stakeholder process.
- CPUC also considers necessary changes to procurement rules and approves the IOUs' bundled procurement plans.
- The costs of new resources authorized for procurement by the IOUs are applied to all LSEs through the Cost Allocation Mechanism (CAM).

2014 LTPP (R.13-12-010)

- 2014 LTPP is divided into two phases:
  - **Phase 1**: System Reliability Needs
  - **Phase 2**: Procurement Rules & Bundled Procurement Plans
- The Scoping Memo Divided Phase 1 into two parts:
  - **1a**: Studies for System & Flexible Resource Need
    (modeling CAISO-wide system resource need)
  - **1b**: Residual System Need
    (determining how to fill any need identified in Phase 1a)

Deterministic vs. Stochastic Modeling

Deterministic Modeling

- A model in which every set of variables is uniquely determined by parameters in the model and sets of previous states of these variables
- Single-iteration simulation
- Produces a single set of outcomes
- CAISO and ORA conducted deterministic modeling in Phase 1a

Stochastic Modeling

- Incorporates some uncertainty (randomness) into model outcomes
- A large set of variations of a specific scenario in simulations
- The variations represent a wide range of possible future outcomes
- Produces multiple sets of results
  - Probabilistic Distributions: Each presents a range of values with associated probabilities

Reliability Needs: Flexible vs. System Shortfall

Flexible Capacity Shortfall

- Occurs when the system does not have enough fast ramping capabilities (either upward or downward), including load-following up/down and spinning/non-spinning reserves
- System capacity can still be available but the surplus capacity is not flexible (unable to ramp up/down quickly)
- Increased intermittent renewable resources create increasing demand for flexible capacity and possible flexibility shortfalls in the future

System Capacity Shortfall

- Occurs when there is insufficient supply to meet the combination of load, ancillary services, and load following requirements
- When capacity shortfalls occur, resources such as demand response and imports are also depleted

ALJ Ruling on Phase 1a / 1b Plan

- On March 25, 2015 a ruling was issued discontinuing Phase 1a stating that there is not sufficient evidence at this time to determine whether or not there is a need for additional flexible or system capacity through 2024.
- Phase 1b was initiated to examine issues regarding flexible capacity. The ruling concluded that there is both sufficient time and a critical need to further develop modeling efforts to inform the 2016 LTPP proceeding regarding the need for flexible capacity through 2026.
- Three technical working groups will examine the following issues with a workshop in the summer:
  - Developing common definitions, metrics, and standards
  - Identifying standard outputs
  - Validating both deterministic and stochastic models and making technical improvements
- Additionally, another workshop will be presented on a zero-curtailment bookend model run by the CAISO and an analysis of challenges related to overgeneration.

Phase 2: Bundled Procurement Plans

AB 57 (PUC §454.5) requires the IOUs to file their bundled procurement plans (BPPs) in the LTPP proceeding

- Unlike Phase 1a which looks at system reliability need for the entire CAISO grid, bundled procurement focuses on **short and medium-term procurement** for the IOUs' individual/bundled customers.
  - One quarter – 3 months (short-term)
  - Less than 5 years (medium-term)
- The CPUC's approval of the IOUs' BPPs establishes "up-front standards" for the IOUs' bundled procurement activities and cost recovery and obviates the need for after-the-fact reasonableness review.
- In the 2014 LTPP proceeding the IOUs were directed to file their BPPs based on the CPUC's Trajectory Scenario and corresponding assumptions.
  - The IOUs were also permitted to provide an analysis based on an alternative scenario and set of assumptions.

Phase 2: Bundled Procurement Plans

SCE, PG&E, and SDG&E filed their draft BPPs on October 3, 2014.

- **SCE:** Requested approval for changes to its hedging strategy as well as changes to the renewable resource contract approval process
- **PG&E:** Included an Alternative Scenario that accounted for greater departing load than the CPUC mandated Trajectory Scenario
  - Due to projected growth in CCAs / DAs
  - Also accounted for more behind-the-meter solar PV
- **SDG&E:** No significant changes to its BPP from previous years

ORA Response to Proposed BPPs

ORA's comments on the IOUs' proposed BPPs recommended that the CPUC:

- Conduct an independent expert review of the utilities' hedging plans to enhance regulatory oversight and provide guidance to the utilities
- Reject SCE's hedging proposal for failure to comply with PUC § 454.5
- Rely on the mandated Trajectory Scenario for PG&E instead of PG&E's Alternative Scenario

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Appendix:
Stochastic Modeling Results & Updated Planning Assumptions

Phase 1a System Reliability Needs

- CPUC requested that the CAISO conduct modeling to determine whether an increased amount of renewables (33% and 40% RPS) would cause system capacity or flexibility shortfalls in 2024.
  - The results would be used to determine how much, if any, new resources (system and flexible) would be needed to meet the state's entire electric demand in 2024.
- SCE and ORA also conducted modeling.
  - ORA was the only party to contribute modeling to the record which validated the CAISO's studies and provide alternative scenarios.
- All modeling is based on the CPUC's standard planning assumptions (i.e., resources, load) and scenarios.

Phase 1a System Reliability Needs Modeling

CAISO, SCE, and ORA all filed modeling testimony on August 13, 2014.

- Parties conducted either deterministic or stochastic modeling.
- These testimonies presented an overview of the scenarios modeled and the results.
- Scenarios include:
  - **Trajectory** (business as usual)
  - **High Load** (higher projected load growth)
  - **Expanded Preferred Resources** (higher projected DG, EE, DR & RPS)
  - **40% RPS in 2024** (increase from current mandate of 33% RPS)
  - **High DG** (higher incremental amount of demand-side small PV)

August 13th Modeling Overview

	CAISO	SCE	ORA
Type of Study	**Deterministic**	**Stochastic**	**Deterministic**
Scenarios Modeled	• **Trajectory Scenario** • **High Load** • **Expanded Preferred Resources** • **40% RPS by 2024**	**High Load Scenario**	• **Trajectory Scenario** • **ORA Scenario 1:** Increased amount of small customer-side PV • **ORA Scenario 2: I**ncludes procurement authorized in Tracks 1 & 4 of the 2012 LTPP (2,700 – 3,600 MW)
Notes	• Assumed unlimited curtailment of renewable resources in all scenarios • Assumed no net exports	Capacity and flexibility shortfalls will occur in the summer months: July, August, and September	Focused on overall capacity need in July 2024 because July was the only month that revealed a capacity shortage in the Trajectory Scenario run

August 13th Modeling Results: No Additional Resources Needed

	CAISO	SCE	ORA
Results	• **Trajectory Scenario:** capacity shortfall of 1,489 MW • **High Load Scenario:** Capacity shortfall of 5,353 MW • All other scenarios had capacity shortfalls except the Expanded Preferred Resources Scenario • No flexibility shortfalls in any scenarios	Net shortfall of 6,200 MW after accounting for Track 1 & 4 authorizations totaling 2,300 MW	• **Trajectory Scenario:** Capacity headroom in all hours of 2024 with the exception of 5 hours of resource shortage across two peak summer days: Thursday, July 18, 2024 and Friday, July 19, 2024 • **ORA Scenario 1**: 1,188 MW shortfall • **ORA Scenario 2**: 164 MW shortfall
Recommend-ations	Argued that the unlimited renewable energy curtailment assumption may be "masking a need for flexible capacity"	No additional resource authorization is needed at this time and CPUC should reexamine issue in the 2016 LTPP	There is no need to procure additional resources at this time

Phase 1a System Reliability Needs: Stochastic Modeling

- On November 20th the CAISO and SCE released results of stochastic modeling based on the Trajectory Scenario.
- The CAISO developed a stochastic production simulation model based on the Trajectory Scenario deterministic model and conducted Monte Carlo simulations.
- The CAISO ran 500 iterations of full-year hourly chronological Monte Carlo simulations.
  - Measured capacity shortfall against the "1 day-in-10 years" reliability standard
  - Focused on capacity shortfall and renewable curtailment
  - Compared results with those from the deterministic runs
- Overall the CAISO & SCE's stochastic modeling results were inconclusive as to need (see results table in appendix).

ORA Testimony on Stochastic Modeling:
Further Refinement of Stochastic Modeling Needed

- SCE's and the CAISO's stochastic modeling methodologies, inputs, and findings require additional review and refinement of approach.
- Because the CAISO's stochastic modeling methodologies are new to the LTPP, the methodology is highly complex and the results are not reproducible.
- Additional exploration of the stochastic model is necessary because the model is not ready to be used for determining need.
- Additional deterministic modeling is useful to understand:
  - How Track 1 and 4 2012 LTPP authorizations (2,700 – 3,600 MW combined total for SDG&E and SCE) not included in the modeling will affect procurement need
  - How renewable curtailment issues can be resolved
- No additional procurement authorization is required at this time.

November 20th Stochastic Modeling Results

	CAISO	SCE
Studies	**Stochastic**	**Stochastic**
Scenario(s) Modeled	**Trajectory Scenario**	**Trajectory and High Load Scenarios**
Results	Capacity shortfall of 8,292 MW	• **Trajectory Scenario:** 2,300 MW of net shortfall or 4,600 MW gross shortfall (not counting Track 1 & 4 resources) • **High Load Scenario:** 5,300 MW of net shortfall or 7,600 MW gross shortfall (not counting Track 1 & 4 resources)
Notes	• Capacity shortfall increased significantly from the deterministic to stochastic simulations • Shortfalls were present in load following-up, non-spinning, spinning, regulation-up, and unserved energy • Number of hours quadrupled • Maximum capacity shortfall (MW) is more than 10 times higher	• **Trajectory Scenario**: July to Sept, Hours Ending (HE) 17 – 21 have highest likelihood of shortfall • **Trajectory Scenario**: Mar to May, HE 9 – 15 have highest likelihood of over-generation • **High Load Scenario:** July to Sept, HE 17 – 21 have highest likelihood of shortfall • **High Load Scenario:** Mar to May, HE 9 – 15 have highest likelihood of over-gen

November 20th Stochastic Modeling Results

	CAISO	SCE
Notes (continued)	• Energy shortfall (GWh) is more than 15 times higher • Shortfalls occurred mostly in July in hours 18 – 21	
Recommend-ations	• Results show there is a greater potential of reliability risk, larger and more frequent capacity shortages, and renewable curtailments than was observed through the deterministic study results • Additional studies are necessary to determine flexible capacity needs and the effect that limited curtailment may have • Even though larger capacity shortfalls have been identified, the CPUC should not make conclusions regarding needed capacity until the CAISO has identified the flexibility characteristics needed	• No additional procurement authorization to meet system needs is necessary at this time • The CPUC should consider other solutions to over-generation including: - Exports - Price incentives - Non-traditional DR - Curtailment - Energy storage - Directed EV charging • Further study is needed to determine which options provide the most cost-effective solutions to over-generation

ORA Response to ALJ's Phase 1a / 1b Plan

- On December 16, 2014 a ruling was issued seeking party comments on a December 9th proposal which laid out a nine-step process for refining modeling in Phase 1a and 1b of the 2014 LTPP.
- Most parties, including ORA, the CAISO, and IOUs supported the nine-points raised the in ruling such as:
  - Further standardization of the inputs and assumptions for use in the scenarios and additional refinements to the stochastic model
  - Utilizing the remainder of Phases 1a and 1b to focus on improving the modeling efforts and developing policy guidelines
  - Establishing a collaborative stakeholder process led by the CPUC's Energy Division for operational flexibility modeling studies
- ORA strongly supports:
  - Repurposing Phase 1b to refining the use of both the stochastic and deterministic modeling for use in the 2016 LTPP system reliability need studies
  - Exploring alternative solutions to reduce over-generation and trade-offs among cost, reliability and environmental concerns

Updated 2015 – 2016 Planning Assumptions

- On March 4, 2015 an Assigned Commissioner Ruling updated the assumptions and scenarios for use in the CAISO's 2015 – 2016 Transmission Planning Process (TPP) and future LTPP proceedings.
- The scenarios remain unchanged from previous LTPP cycles:
  - Trajectory
  - High Load
  - Expanded Preferred Resources
  - 40% RPS in 2024
  - High DG
- Updated assumptions were not a comprehensive overhaul, and related specifically to updated demand information, locational information for preferred resources, accounting for demand response, modifying retirement assumptions, and correcting previous errors in capacity accounting.